

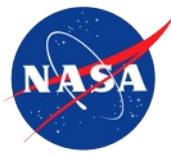
AI/ML Panel

PRACTICAL AND SAFE IMPLEMENTATION OF AI/ML FOR AVIATION PURPOSES

Wes Ryan – NASA Ames (Nasa Aeronautics Research Institute)

April 27, 2022, Panel 4:00 – 4:45 pm





Practical AI/ML Use in Aviation

- AI/ML Can Provide Transformational Capabilities – Great Potential
- Capabilities and Safety Assurance Rigor Require More Than “Levels” of AI/ML
- Must Consider Intended Function, Use Case, and Operational Risk
- Safety Hinges on Bounded Behavior/Authority
- R&D Partnerships with NASA For Maturation and Integration Strategies (Aircraft, Operations, and Airspace Integration Capabilities)



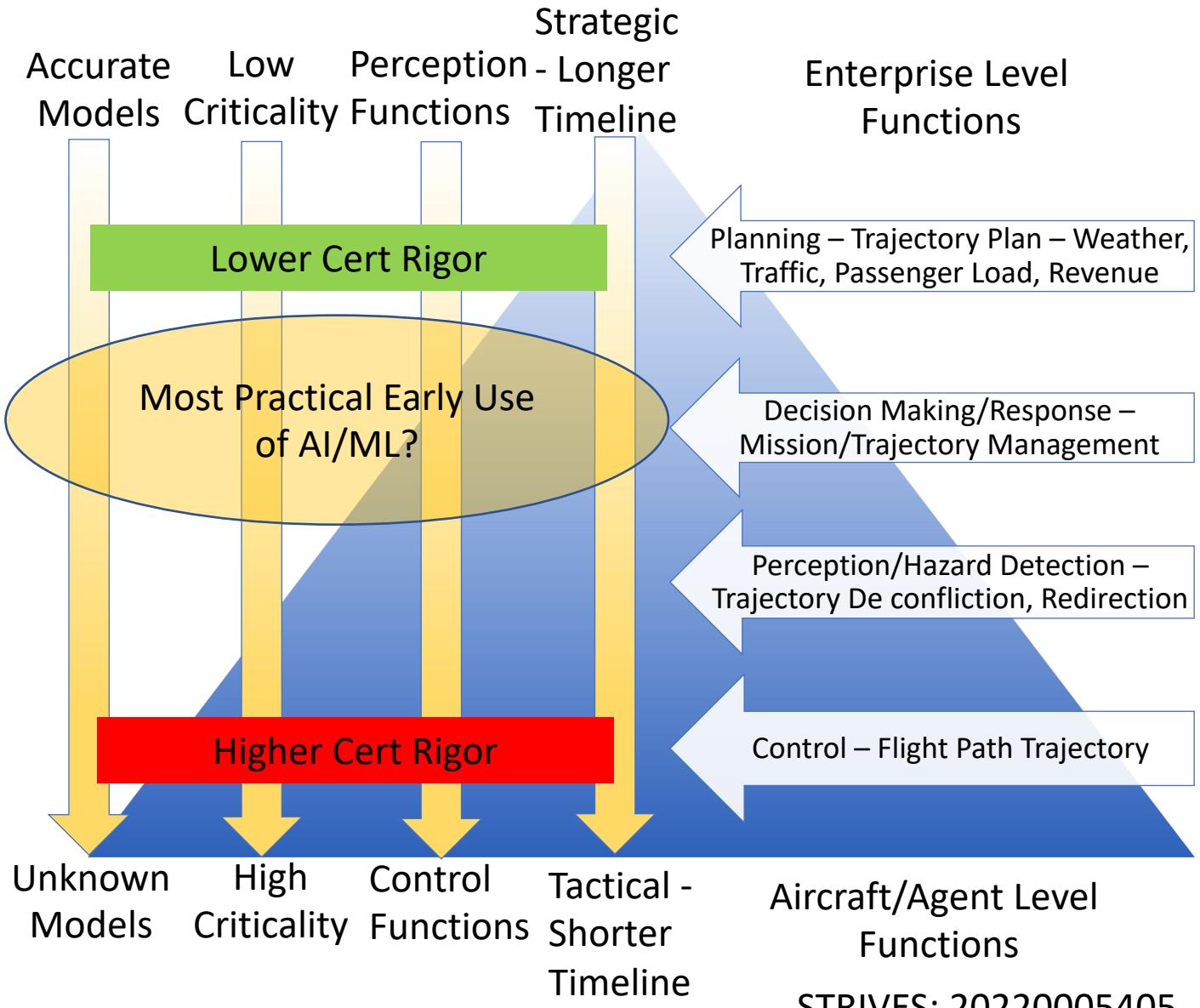
AI/ML & Automation Construct

Given:

- Perception Functions Are More Difficult to Model, Less Bound by Known Model/Physics
- Control Functions Well Understood, Governed by Flight Dynamics and Physics of Aircraft/Trajectory Models
- Tactical Decisions Have Shorter Timeline, Greater Urgency
- Strategic Decisions Have Longer Timeline, Less Urgency

Our Shared Challenge:

- Where Should We Focus Automation & AI/ML in the Near Term, Mid Term, Long Term? Safety Critical or Route Efficiency Improvement Functions?
- What Risks/Challenges Do We Face for Moving Automation & AI/ML from Tactical to Strategic Decision Making, or From Control Functions to Perception Functions?





Backup Slides

Building-in Robust Safety Assurance



- Compare Risk-based, Model Based Automation Development to Pilot/Crew Development Process
- How Do We Build In Proficiency, Robust Function?

Scenario-based Training With Instructor + Repetition + With Expected Outcomes/Behavior



Initial Aptitude
and Skill

Basic
Proficiency

Resilient
Proficiency

Civil
Trustworthiness

Simulation & Flight Test to Demonstrate Readiness for Intended Use, Type of Operation, Task Criticality



Initial “Aptitude
and Skill” in
System Function

Proven Basic
Proficiency

Proven Resilient
Proficiency

Proven Civil
Trustworthiness



Must Work-up to Resilient/Robust Assurance in Automation Designs



Notional Automation Capability Maturity Model

Capability

New ability, expertise, or proficiency

Functions/ Services

Task, role, and/or system effects which enable a *Capability*

Technology

Equipment including HW/SW which provides *Function/Service*

Data

Information sources used by *Technology*

Must assess maturity, integrity, reliability, availability, etc. of data sources & technology to implement an intended function in support of a new capability



Benefit of Using CMM Concept for Automation

- Methodical Progression from Prototype, to Initial Function with Human Monitoring/Backup, to Safety Responsible Function
- Common Framework for Analyzing Each Step Towards Proven Capability

